M840 Dissertation in Mathematics

Guide to LaTeX

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Abstract

This document explains how to install a working version of LaTeX and other associated components from the course software, and how to start using LaTeX to produce documents with high-quality mathematical typesetting.

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Chapter 1

Introduction and Installation

1.1 Overview

Producing a document using LaTeX is quite different to producing a document using a word processor; LaTeX is not a WYSIWYG program, so you don't immediately see what you write in a plain text file, even though you know what you think you have written; it also requires a bit more setting up. However, it is easier to obtain a really high-quality finished product, particularly where there is a lot of mathematics, using LaTeX rather than using a word processor.

This document has been produced using LaTeX, using the same style file, `mscreport.cls`, that is suggested you use for your document as it will provide an appropriate structure. After you have installed the course software, the tex file and the pdf version, with bookmarks, of this document will be found in the folder
`c:\TeXlive2005\texmf-local\Inputs\mscproject\guide`,
and they are called `guide.tex` and `guide.pdf`; `guide.tex` calls up other files, as explained in Section 2.2.7 on page 19. I have used some special commands to produce links (blue-coloured links to pages and sections, pink-coloured links to websites) within the pdf document, to make it easier to navigate through the document when viewed onscreen; however,

In this document, file names and LaTeX commands are in this `typewriter` font.

this feature will not be present in the report that you will write.

The process of producing a finished document using LaTeX is done within an IDE (integrated development environment); it is suggested that you use TeXnicCenter which is on the second installation disk. The details of the compilation and viewing process are outlined in Appendix A.

LaTeX is introduced in Section 2. How to work with TeXnicCenter is explained in Section 3.

All the software that comes on the two course CDs is in the public domain and freely available, or developed by the OU specifically for this course. The public domain software has been stored on these CDs so that you don't have to download it from the web.

TeXLive2005 is produced and maintained by the TeX User Group, `http://www.tug.org/`, and we are grateful for the resources that they make available to the TeX community.

TeXnicCenter is a project maintained by volunteers and, again, we acknowledge their contribution to the TeX community.

Contributions, either financial or creative, to either organisation are always welcome.

1.2 Installation

1.2.1 Components

The software provided for the installation of LaTeX comes in two CDs:

CDR1195 is the standard TeXLive2005 CD;

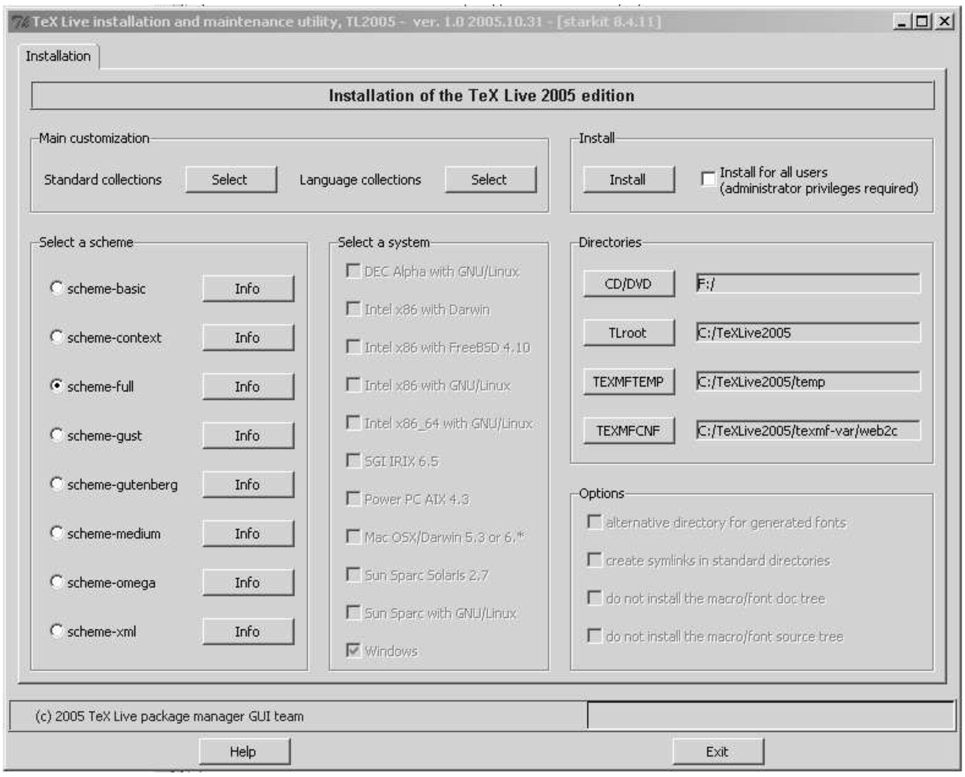
CDR1203 contains additional programs, including TeXnicCenter, Ghostscript, Ghostview, and some course files.

The packages are installed in the order LaTeX (CDR1195), Ghostscript, Ghostview, and TeXnicCenter (CDR1203). It is best to choose the default folder each time, since it is easier to maintain and support at a distance; also, all the references to folders in these instructions assume the default choice of folder. The full installation of both disks will require approximately 1200 Mb of space on your hard disk drive.

1.2.2 TeXLive installation of LaTeX

First insert CDR1195, and the TeXLive installation package should start up straightaway. If the CD does not autorun, run the installation from `D:\setup-win32\tlpgui.exe` (assuming that `D:` is your CD-ROM drive).

When you see the **Installation** window, similar to the one in Figure 1.1, you are presented with a choice of installation schemes. It is recommended that you choose the '*scheme-full*' installation, provided that you have enough space on your hard disk; otherwise, you can omit the installation of the many other language options; if the free space on



TeX Live installation and maintenance utility, TL2005 - ver. 1.0 2005.10.31 - [starkit 8.4.11]

Installation of the TeX Live 2005 edition

Select a scheme:
○ scheme-basic
○ scheme-context
● scheme-full
○ scheme-gust
○ scheme-gutenberg
○ scheme-medium
○ scheme-omega
○ scheme-xml

Select a system:
☐ DEC Alpha with GNU/Linux
☐ Intel x86 with Darwin
☐ Intel x86 with FreeBSD 4.10
☐ Intel x86 with GNU/Linux
☐ Intel x86_64 with GNU/Linux
☐ SGI IRIX 6.5
☐ Power PC AIX 4.3
☐ Mac OSX/Darwin 5.3 or 6.*
☐ Sun Sparc Solaris 2.7
☐ Sun Sparc with GNU/Linux
☑ Windows

Install:
☐ Install for all users (administrator privileges required)

Directories:
CD/DVD: F:/
TLroot: C:/TeXLive2005
TEXMFTEMP: C:/TeXLive2005/temp
TEXMFCNF: C:/TeXLive2005/texmf-var/web2c

Options:
☐ alternative directory for generated fonts
☐ create symlinks in standard directories
☐ do not install the macro/font doc tree
☐ do not install the macro/font source tree

(c) 2005 TeX Live package manager GUI team

Figure 1.1: The TeXLive installation window showing suggested defaults

your hard disk is severely restricted, then choose the '*scheme-medium*' installation, but you may need to install more packages later; you will need this CD to install more packages, or download them from the web.

Having selected '*scheme-full*' (or having decided to leave the default '*scheme-medium*'), click the **Install** button towards the top right of the window. The installation may take up to half-an-hour.

When the installation has finished, close any open windows and remove the CD from the CD-ROM drive.

1.2.3 Adobe Reader

If you don't already have Adobe Reader installed, then install it from the **Online Applications** CD-ROM. The default folder location is recommended.

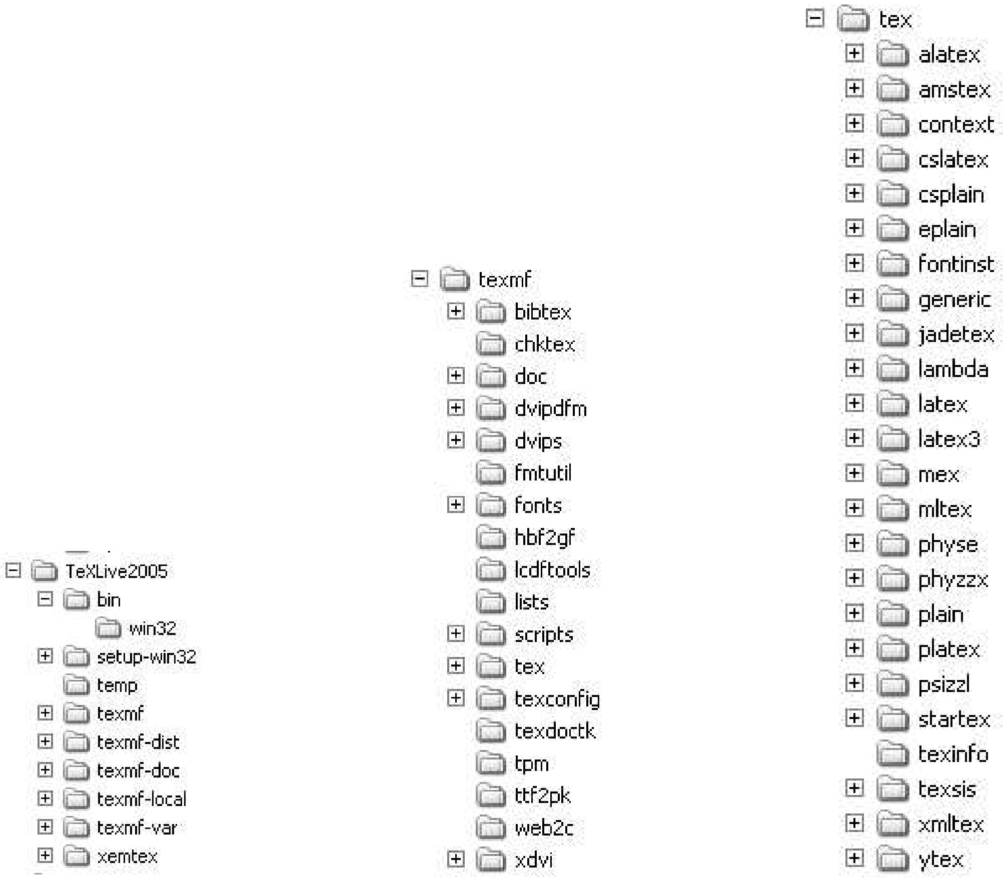
It is assumed that Adobe Reader 7.0 is stored in the default location. If you have upgraded to Adobe Reader 8.0, then there will be a problem when viewing your .pdf output; go to the OUSA conference (see Section 2.3.4 on page 22) for advice.

1.2.4 Installing the other components

Now insert CDR1203 into the CD-ROM drive. A window is displayed with the folder '`M840`'. Open this folder and run the file `texinstall.bat`. This will install:

- Ghostscript and Ghostview
- TeXnicCenter
- Course files.

Accept all the defaults, including the default folder locations. You will have to 'Accept' the license agreement for TeXnicCenter before the in-



(a) TeXLive2005 subfolders (b) TeXLive2005\texmf (c) TeXLive2005\texmf-dist\tex

Figure 1.2: TEX directory structure

stallation will proceed. You may also want to tick the box in the TeXnicCenter installation for a desktop shortcut to TeXnicCenter.

Windows showing shortcuts are displayed after each program is installed, and you may want to close these windows when they appear.

1.2.5 Note on the file structure of the TEX system

There is a recommended file structure for a TEX system. The main reasons for the recommended structure are to make it easier to upgrade the system, and to maintain compatability between users. The top-level directory structure is shown in Figure 1.2(a).

Packages that are not part of the distribution, and your own files should be in subfolders within `texmf-local`; these won't be affected by future updates. Each of the subfolders beginning with `texmf...` has a fairly similar structure, and an example of the `texmf` subfolders is shown in Figure 1.2(b) on the facing page. The `C:\TeXLive2005\texmf-dist\doc` and `C:\TeXLive2005\texmf-doc` folders contain the instruction manuals for most of the LaTeX packages.

It is recommended that your MSc dissertation should be in the folder
`c:\TeXlive2005\texmf-local\Inputs\mscproject`
as this will help any support at a distance.

Additional packages should be placed either in
`c:\TeXlive2005\texmf-local\tex\latex\` ...
if they are specifically for LaTeX, or in
`c:\TeXlive2005\texmf-local\tex\generic\` ...
otherwise; but it is not that crucial.

Folder and file names should not contain spaces; use the underscore to join up two words together, e.g. `intro_gardening`, or use capital letters to start each word in the file name, e.g. `IntroGardening`.

1.3 Maintenance

The list of files in the folders (and their subfolders):
`c:\TeXLive2005\texmf`,
`c:\TeXLive2005\texmf-dist`,
`c:\TeXLive2005\texmf-local`,
`c:\TeXLive2005\texmf-var`
is kept as a list in files called '`ls-R`' in each of these folders. To save time, the LaTeX compiler will search the '`ls-R`' files in order to find any files, package and class files that have been called by the main file. If a new file is created, apart from the one on which you are currently working, then it is necessary to rebuild this listing.

Open **TeXLive Manager** from **Start|Programs** and click on the **Manage the installation** tab. Click on the button entitled `Refresh the ls_r database`. The rebuilding will take a few minutes; exit from the TeXLive Manager when it has finished.

You will have to close TeXnicCenter and reopen it after this has been done, so that the new '`ls-R`' file is uploaded.

1.4 Uninstalling

If you wish to uninstall all this software, you should uninstall TeXLive first. Open TeXLive Manager from **Start|All Programs|TeXLive2005|TeXLive Manager**; select the tab '**Remove the installation**' and click on '**Remove**'. The uninstalling will take a few minutes.

When it has completed, open '**Control Panel|Add/Remove Programs**' and remove programs in the following order:

- TeXnicCenter
- Ghostview
- AFPL Ghostscript
- AFPL Ghostscript Fonts.

Chapter 2

LaTeX

2.1 Introduction

This is an introduction to some of the features in LaTeX. I don't want to duplicate some of the excellent material that is to be found on the Web, but to show some of the features that you might need for writing your report in LaTeX.

You may find it useful to look at a LaTeX text file as you go through this section. Section 3 on page 24 explains how to open a LaTeX file in TeXnicCenter.

Some reasons for using LaTeX are:

- LaTeX typesets mathematics beautifully;
- helps in structuring the document;
- has useful features such as
  - the generation of table of contents, list of tables and figures automatically;
  - association of references with logical labels;
  - the ability to define macros (with parameters) to reduce typing and introduce uniformity;
  - the use of floats for tables and figures so that they can be moved to another position, instead of creating a void after them;

- excellent peer support, with many users' groups;
- many extra packages and add-ons, such as the one for including graphics.

The main features of a LaTeX document are:

- LaTeX is a mark-up language where the commands for structuring the document are intermingled with the content;
- commands usually begin with a backslash, e.g. `\par` for a new paragraph, `\\` for a new line;
- commands can contain optional values, e.g. `\\[0.5in]` to write a new line 0.5 inches lower;
- styling commands are defined in a style file, usually with extension .sty or .cls, so that logical commands such as `\section{Section heading}` will start a new section, with space before and after it, and put the 'Section heading' in a larger font;
- environments enclose a whole structure, and they start with `\begin{environment}` and end with `\end{environment}` where 'environment' is the name of the environment (e.g. *center*[1] to center the text within the environment, *enumerate* to produce an enumerated list);
- curly braces ($\{\ldots\}$) delimit groups.

This document has all these features, and it may be worth looking at the raw tex file (see Section 2.2.7) that produced this document.

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[1] American spelling is used in this context.

2.2 Some features of LaTeX

2.2.1 Style commands

All the sectioning commands in this document have been produced by using the commands (in descending order): `\part` (not used in this document), `\chapter`, `\section`, `\subsection`, `\subsubsection`; followed by the title in curly brackets. There are many advantages to using these style commands:

I have used too many sectioning commands in this document, but I wanted to show you the range of commands.

- the style is predetermined in the style file; changing the style file will change the style throughout the document automatically and effortlessly (this style file, mscreport.cls, is designed specifically for your dissertation);
- the parts, sections, etc. will be automatically numbered;
- each sectioning component will be included in the table of contents;
- each sectioning component can have a logic label that can be referenced (see Section 2.2.2 on the following page);
- it allows the author to concentrate on the logical structure and content of the document.

LaTeX works on tokens, and each letter or symbol is taken as a separate token, unless it is prefixed with a backslash, in which case it is taken as a whole command (ended by a space, a number or one of the brackets). If you are using TeXnicCenter, you will see that each command is in blue. To create a group of symbols, enclose them in curly braces. For example `\section Title` will give

3.1 T

itle

whereas `\section{Title}` will give

3.1 Title

2.2.2 Labels and references

One of the many beauties of LaTeX is the use of logical labels. Within a part, section, subsection, etc. you can write `\label{name}` where `name` is any name of your choice. Then you can use `Section~\vref{name}` to refer to that part of the document, and the section number will follow 'Section'. Furthermore, using `\pageref{name}` will give the value of the page on which the section occurs, and you can write
`Section~\vref{name} on page~\pageref{name}`.

Labels can also be used in figures, tables (see Section 2.2.4 on the next page) and equations (see Section 2.2.3).

2.2.3 Typing mathematics

Mathematics is either typeset in line (e.g. $\sin(x) = 1$), or displayed in a separate paragraph, as in

$$\frac{d}{dx}(\sin x) = \cos x$$

either with no equation numbers, or with equation numbers as in

$$\frac{d}{dx}(\sin x) = \cos x, \tag{2.1}$$

and you can refer to the equation with a label, e.g. see Equation 2.1.

In TeXnicCenter the text within in line mathematics is coloured green, except for LaTeX commands.

The text-style maths is obtained by `$\sin(x)=1$`, the displayed maths using `\[ \frac{d}{dx}(\sin x)=\cos x \]`,
and the numbered equation with

```
\begin{equation}
  \frac{d}{dx}(\sin x)=\cos x,  \label{eq1}
\end{equation}
```

2.2.4 Floats

Certain components of a document such as figures and tables cannot be split. However, their inclusion at a particular point in the document may create unnecessary space. TeX has the ability to position the component where it will be more efficient, using ‘floats’.

The environments `figure` and `table` set up the appropriate floats. For example, the following lines of text produce the output seen in Figure 2.1.

`htb` specifies the order of preference for the location of the figure; ‘here’, ‘top of page’, ‘bottom of page’ respectively.

```
\begin{figure}[htb]
\begin{center}
\includegraphics[width=3in]{musicexample.eps}
\caption{Example of setting music using \LaTeX\label{music}}
\end{center}
\end{figure}
```

The label command is within the caption as otherwise it will create a label for the section in which it occurs.

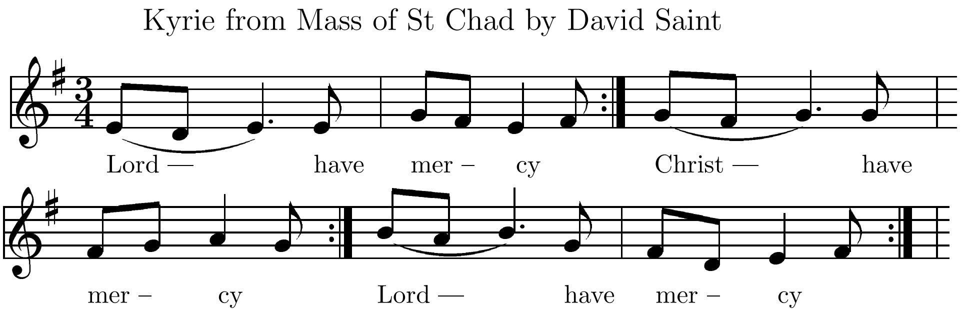

Kyrie from Mass of St Chad by David Saint
Lord — have mer – cy Christ — have
mer – cy Lord — have mer – cy

Figure 2.1: Example of setting music using LaTeX

2.2.5 Graphics

The mscreport class file, `mscreport.cls`, automatically loads the `graphicx` package (see Section 2.2.6 on the next page) that is used to insert files (usually picture files) from other programs and an example is given in Section 2.2.4 and seen in Figure 2.1. The insert can be scaled, rotated, and given a caption and a label; the TeXnicCenter Help menu explains this in more detail, and an example of how to modify a picture file is shown in Figure 3.13 on page 36.

The format of the graphics file must be encapsulated postscript (EPS) if one is going through the `dvips` route (i.e. processing the plain tex file to a readable DVI file, and then to a postscript file), and viewing the document in Ghostview (the dvi viewer won't show the .eps graphics files). If you are compiling with `pdflatex` (i.e. processing the plain tex file to a PDF file to be viewed in Adobe Reader), then the graphics file format can be JPEG, PNG, PDF or Metapost.

Simple diagrams can be constructed using the `picture` environment, and an example is given on page 40. See the TeXnicCenter Help pages on the `picture` environment or one of the reference books for more details.

2.2.6 Packages

Basic LaTeX has been augmented by 'packages' which have been written by users to fulfill a specific task. The difficulty lies in finding which package will suit your particular task, as there are many such packages, and they perform a variety of tasks.

The mscreport class file, `mscreport.cls`, that has been designed for your dissertation loads these packages, which you may find useful:

1. graphicx — to include graphics files;
2. amsmath — an extension to the basic mathematics commands and symbols;
3. varioref — to produce more attractive references such as "... on the following page ...";
4. subfigure — to produce figures side by side;
5. url — to set URLs.

Other packages that have been loaded for the production of this guide or the style file for your dissertation, but probably not required by you are:

1. hyperref — to produce hyperlinks in a pdf;
2. calc — to extend the capability for calculations with counters and dimensions, and not recommended for arithmetic calculations in your dissertation;
3. fancyhdr — to produce fancy headers and footers;
4. geometry — to change the size of the printed page.

The LATEX Companion (see Book 2 on page 21 in the book list) is a good reference for other packages; otherwise put a question to one of the many user groups, and you should receive helpful replies from the TEX community.

2.2.7 Breaking up the document into smaller chunks

LATEX has a command called `\include{foo}` that includes the tex file, `foo.tex`, at that location. The advantage of this command is that one can break up a long document into a number of smaller files which may make it more manageable. The other benefit is that one can include one or more files at a time, by using e.g. `\includeonly{foo4,foo5}`. This saves the whole document being recompiled each time; information about page numbers, labels, etc. is kept so that all the references are retained and used correctly.

The one disadvantage is that at each `include{...}` a `\newpage` is issued, and the document starts again on a new page.

This document is composed of five files, and this structure can be seen in Figure 3.5 on page 29:

1. `guide.tex` — this is the root file which specifies the packages and calls the other files;

2. `installation.tex` — the contents of Chapter 1 on page 6;
3. `latexintro.tex` — the contents of Chapter 2 on page 13;
4. `txc.tex` — the contents of Chapter 3 on page 24
5. `appendix.tex` — the contents of Appendix 3.5.1 on page 39.

The file names can be seen in Figure 3.5(c) on page 29 and the structure in Figure 3.5(a) on page 29.

2.2.8 Producing an index and bibliography

LATEX can produce an index and bibliography, using similar constructs to the labels and cross-references that were introduced in Section 2.2.2 on page 16. If you want to use either feature, read one of the recommended sources on LATEX, and put a message on the FirstClass conference, for which details are given in Section 2.3.4 on page 22.

2.3 Resources for learning LATEX

2.3.1 Most recommended

1. **The Not So Short Introduction to LATEX 2$_\varepsilon$** can be found in `C:\TeXLive2005\texmf-doc\doc\english\lshort-english\lshort.pdf`
2. The Cambridge University Engineering Department Website (see item 2 in the list in Section 2.3.3 on the next page has references to some excellent (and free) introductions to LATEX; in particular I recommend **Advanced LATEX**, and **A Simplified Introduction to LATEX** by *H. J. Greenberg* and to be found in `c:\TeXLive2005\texmf-local\doc\simplified\simplified-intro.ps`
3. The TeXnicCenter Help pages — see Section 3.5 on page 35.

4. **The Guide to LaTeX** — item 1 in the list of books in Section 2.3.2 — is the best starter (and advanced) book.

2.3.2 Books

1. The Guide to LaTeX (Fourth Edition) *Kopka & Daly* Addison-Wesley ISBN 0-321-17385-6; I found this most helpful of all the books.
2. The LaTeX Companion (Second Edition) *Mittelbach et al* Addison-Wesley ISBN 0-201-36299-6 ; a reference book of 1200 pages.
3. LaTeX: A Document Preparation System *Lamport* Addison-Wesley ISBN 0-201-52983-1; the original book on LaTeX.
4. The LaTeX Web Companion *Goossens & Rahtz* Addison-Wesley ISBN 0-201-43311-7; only useful if you want to produce material for the Web.
5. The LaTeX Graphics Companion *Goossens et al* Addison-Wesley ISBN 0-201-85469-4; for advice on creating or importing graphics to your document.

2.3.3 Web information

1. A very good introduction to LaTeX can be found on the TUG India site, `www.tug.org.in/tutorials.html`
2. A number of reference sites can be found on the Cambridge University Engineering Department site:
   `www-h.eng.cam.ac.uk/help/tpl/textprocessing/LaTeX_intro.html`
3. This is a complete novices guide to LaTeX.
   `theoval.cmp.uea.ac.uk/$\sim$nlct/latex/novices/novices{_}a4.pdf`
   It takes a bit of an odd course at times, and some may prefer to go straight for the not-so-short guide, following.

4. A longer introduction can be found in `C:\TeXLive2005\texmf-doc\doc\english\lshort-english\lshort.pdf` This does what is says in the title, 'The Not So Short Introduction to LATEX 2$_\varepsilon$'. This is probably the best second (or even first) thing to read.
5. `ftp://ftp.ams.org/pub/tex/doc/amsmath/amsldoc.pdf` This is the guide to the AMS (American Mathematical Society) package amsmath that is a virtual necessity, and is loaded automatically.
6. `www.artofproblemsolving.com/LaTeX/AoPS_L_About.php`; this has some excellent sections on installation, and an introduction to LATEX.
7. `ftp://ftp.ams.org/pub/tex/doc/amsmath/short-math-guide.pdf` This is the other (it's not shorter) version of the above, and probably sufficient for most of your needs as a first reference.
8. At some point you will want to use a symbol that is not in your current LATEX setup, in which case look in `c:\TeXLive2005\texmf-doc\doc\english\comprehensive\symbols-a4.pdf`
9. An excellent introduction to PStricks can be found on `www.sarovar/projects/pstricks/`. PStricks is a front end for producing postscript code to create diagrams in LATEX.

2.3.4 OUSA conference on TEX

The FirstClass conference name is 'OUSA LaTex and TeX', and by writing this[2] in the `To:` field of a new message in the OU email system FirstClass, it will be put in the right conference. The actual conference resides in **Desktop|Open University|OUSA Signpost|OUSA LaTex and Tex**. This is useful if you want to drag it to the offline conferences (if you use FirstClass personal) or onto the desktop, for easier access.

---

[2] The minimum to write is '`OUSA Latex`'.

Use this conference for information and help. It has proved a valuable resource for other LaTeX users in the OU.

2.3.5 UKTUG

The URL of the UK branch of the TeX User Group is `uk.tug.org`.

Chapter 3

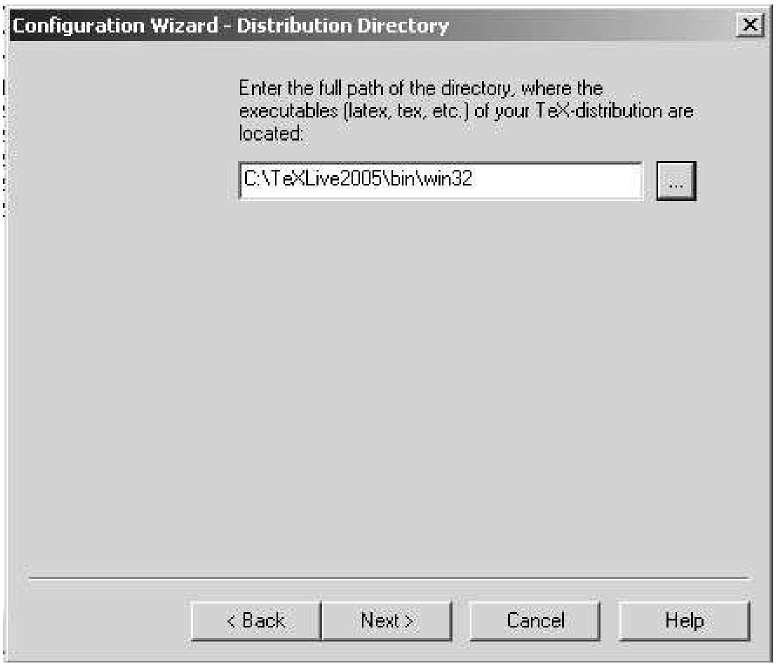
TeXnicCenter

3.1 Initialising TeXnicCenter

Open TeXnicCenter from **Start|Programs|TeXnicCenter|TeXnicCenter**. When TeXnicCenter is opened for the first time after installing, *Tip of the Day* is displayed, and you should close this window. This is followed by the **Configuration Wizard — Welcome** window. Click on **Next**, and the **Configuration Wizard — Distribution Directory** window opens; the required full path is `C:\TeXLive2005\bin\win32` which is seen in Figure 3.1 on the facing page, and this path can be entered by using the browsing button to the right of the path entry box. Click on **Next** to bring up the next window, and then **Finish** to complete the configuration of the output profiles.

Now click on **Tools|Options** and choose the **Directories** tab to bring up the window seen in Figure 3.2 on page 26, where the folders will be different. Add the folders seen in Figure 3.2 on page 26, namely `C:\TeXlive2005\texmf-local\templates` (twice) and `C:\TeXlive2005\texmf-local\Inputs` respectively, and remove the unwanted paths using the **Remove** button when that path is highlighted in the window. Click on **OK**.

To make your TeXnicCenter window correspond to almost the same



Configuration Wizard - Distribution Directory

Enter the full path of the directory, where the executables (latex, tex, etc.) of your TeX-distribution are located:

C:\TeXLive2005\bin\win32

Figure 3.1: The configuration window for the path of the executables

views as in this section, click on **File|Open Project ...** and in the directory window, find the file

`c:\TeXlive2005\texmf-local\Inputs\mscproject\guide\guide.tcp`

open it and this will open the project that created this guide.

The concept of a project is explained in Section 3.4 on page 33, but that can be left unexplained until you come to it later.

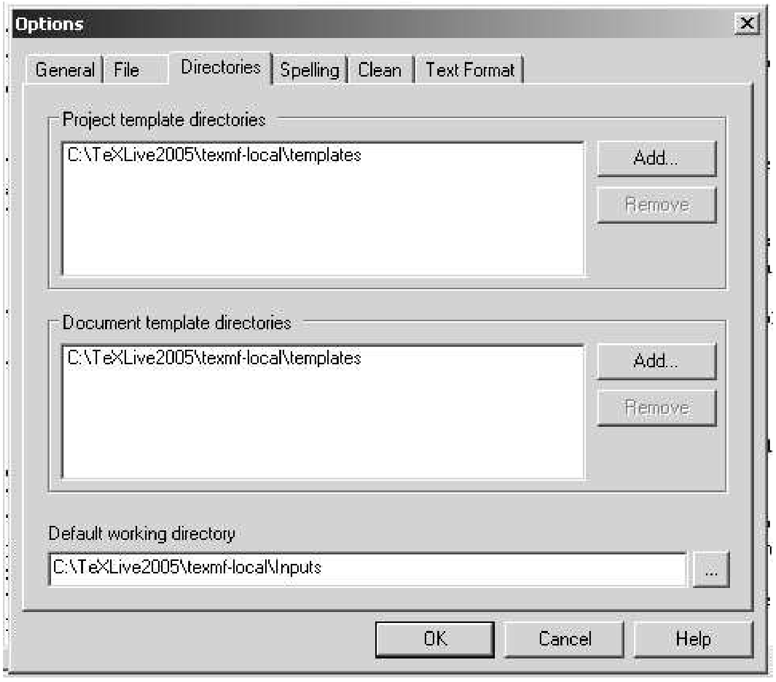
If some of the files within a project are not visible, click on the **Files** tab to be found somewhere to the left and bottom of the window, and then expand the **LaTeX files** line by pressing the $\boxed{+}$ button; you should see something similar to that seen in Figure 3.3 on page 27.

To place a file into the composing window, double-click on it in this pane; note the tabs that are introduced at the bottom of the composing pane for each file. The screen should look similar to that in Figure 3.4 on page 28.

3.2 Using TeXnicCenter

A typical TeXnicCenter window is shown in Figure 3.4 on page 28, and

My TeXnicCenter has been customized using **Tools|Options** and may look slightly different from yours.



Project template directories
C:\TeXLive2005\texmf-local\templates

Document template directories
C:\TeXLive2005\texmf-local\templates

Default working directory
C:\TeXLive2005\texmf-local\Inputs

Figure 3.2: Customizing the default directories

has four main areas, or panes:

1. the Toolbar which is the very wide but very shallow pane across the top of the window, with pull down menus, or simple commands; see Section 3.2.1 on the next page;
2. the Navigator pane on the left, further explained in Section 3.2.2 on the facing page;
3. the text pane on the right, where the document is composed, and brief information on this is in Section 3.2.3 on page 29;
4. the long pane across the bottom, where the steps in the compilation, and any errors, are shown; this is further explained in Section 3.2.4 on page 30.

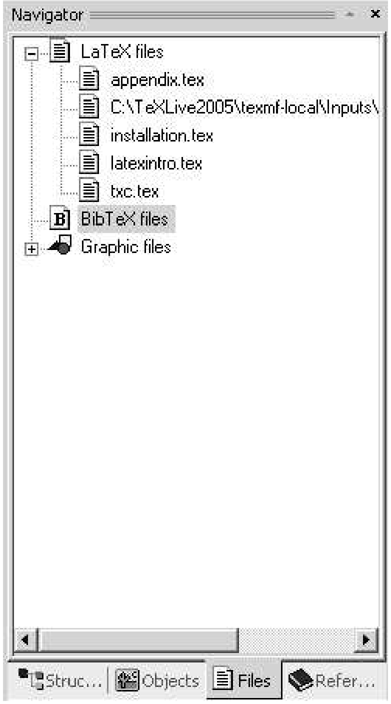


Figure 3.3: List of files for this guide

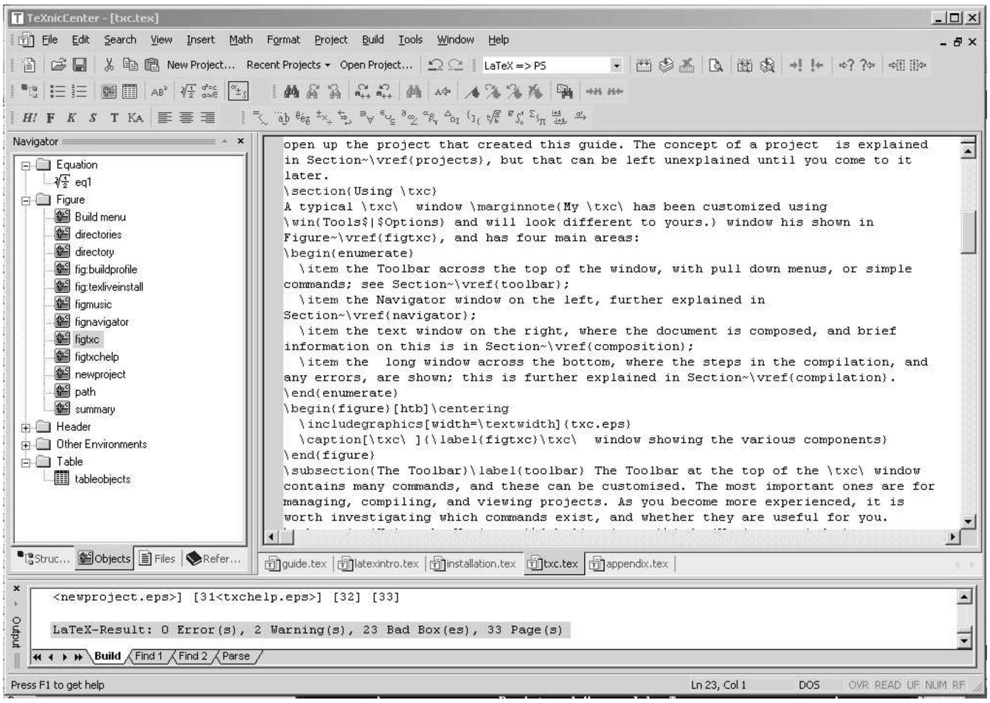
3.2.1 The Toolbar

The Toolbar at the top of the TeXnicCenter window contains many commands, and these can be customised. The most important ones are for managing, compiling, and viewing projects. As you become more experienced, it is worth investigating which commands are present on the toolbar, and whether they are useful for you.

3.2.2 Using the Navigator

The left-hand pane shows the structural components of the document, and has four views, selected by tabs at the bottom of the pane. Figure 3.5 on page 29 shows three of the four views for this document.

1. ‘Structure’ shows the structure of the document, with indents for parts, chapters, sections, etc; it also shows the graphics file that have been included, as can be seen in Figure 3.5(a) on page 29.


TeXnicCenter - [txc.tex]
File Edit Search View Insert Math Format Project Build Tools Window Help
New Project... Recent Projects Open Project...
LaTeX => PS
Navigator
Equation
eq1
Figure
Build menu
directories
directory
fig:buildprofile
fig:texliveinstall
figmusic
fignavigator
figtxc
figtxchelp
newproject
path
summary
Header
Other Environments
Table
tableobjects
Struc... Objects Files Refer...
guide.tex latexintro.tex installation.tex txc.tex appendix.tex
Output
Build Find 1 Find 2 Parse
Press F1 to get help
Ln 23, Col 1 DOS OVR READ UF NUM RF

```
open up the project that created this guide. The concept of a project  is explained
in Section~\vref{projects}, but that can be left unexplained until you come to it
later.
\section{Using \txc}
A typical \txc\  window \marginnote{My \txc\ has been customized using
\win{Tools$|$Options} and will look different to yours.} window his shown in
Figure~\vref{figtxc}, and has four main areas:
\begin{enumerate}
  \item the Toolbar across the top of the window, with pull down menus, or simple
commands; see Section~\vref{toolbar};
  \item the Navigator window on the left, further explained in
Section~\vref{navigator};
  \item the text window on the right, where the document is composed, and brief
information on this is in Section~\vref{composition};
  \item the  long window across the bottom, where the steps in the compilation, and
any errors, are shown; this is further explained in Section~\vref{compilation}.
\end{enumerate}
\begin{figure}[htb]\centering
  \includegraphics[width=\textwidth]{txc.eps}
  \caption[\txc\ ]{\label{figtxc}\txc\  window showing the various components}
\end{figure}
\subsection{The Toolbar}\label{toolbar} The Toolbar at the top of the \txc\ window
contains many commands, and these can be customised. The most important ones are for
managing, compiling, and viewing projects. As you become more experienced, it is
worth investigating which commands exist, and whether they are useful for you.
```

```
<newproject.eps>] [31<txchelp.eps>] [32] [33]

LaTeX-Result: 0 Error(s), 2 Warning(s), 23 Bad Box(es), 33 Page(s)
```

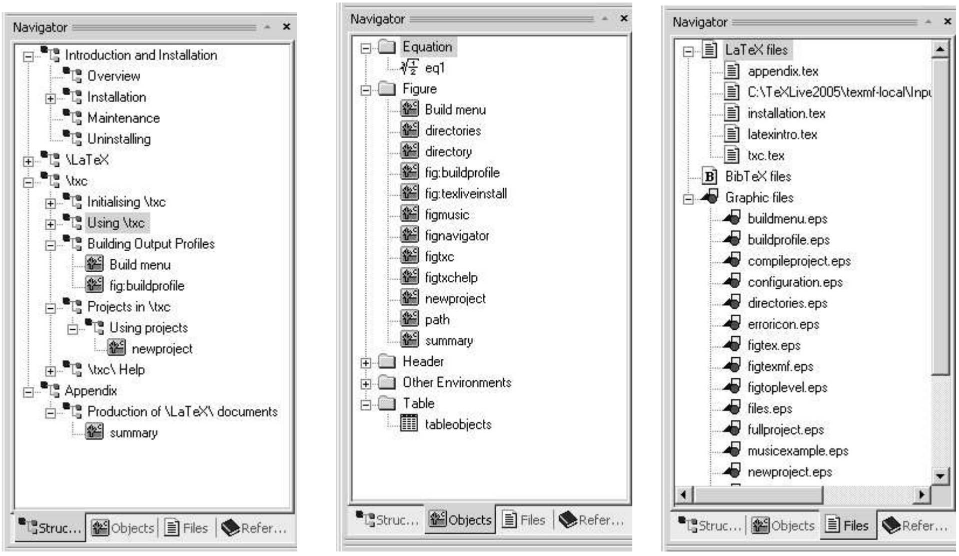
Figure 3.4: TeXnicCenter window showing the various panes

2. 'Objects' shows the various components in the document as explained in Table 3.1 and shown in Figure 3.5(b) on the next page; it contains all the labels used in the document, and this is very useful for reference.

3. 'Files' shows the files, both LaTeX and graphics, that have been used within the document, as seen in Figure 3.5(c) on the facing page.

Table 3.1: Components in the Objects window

Object	Contents
Equation	Displayed maths equations that have equation numbers
Figure	Labels for the figures in the document
Header	The section headings
Other Environments	Other structural environments
Table	Labels for the table environments (floats)



(a) Structure subpane (b) Objects subpane (c) Files subpane

Figure 3.5: The three possible panes in the Navigator pane

Double-clicking on an item in the Navigator pane will take you to that item in the LaTeX document, even opening the file if it is not already open. This makes the finding of items so much easier in a complex document.

3.2.3 The composition pane

If you want to do any typing or editing at this stage, then I suggest that you create a new file.

The document is composed in this pane. Either type the commands or use the pull-down menus in the toolbar; it is possible to change the menu of commands using **Tools|Customize**.

For some commands and environments, TeXnicCenter makes a suggestion as it is being typed; to accept the suggestion, type `CTRL+space`.

When you type a bracket (either round, square, or curly), it is coloured red to denote that it is not yet matched. As you type in the matching bracket, then both brackets are coloured green, and the enclosed text is given a slight pink highlight. Typing `CTRL+m` will highlight the text within the innermost set of brackets, and continuing with `CTRL+m` will find the next outer set of brackets, eventually highlighting the whole file (if all the brackets match); this feature can be very useful to unearth unmatched brackets.

3.2.4 The compilation pane

This pane, along the bottom of the TeXnicCenter window, reports the stages of the compilation. At the end of the compilation, this pane will show you how many errors, warnings, bad boxes, and how many pages have been produced. The errors can be found one by one, either by typing F9 or by clicking on the icon ⇨! on the Toolbar at the top; either of these actions moves the cursor to the source of the error in the composition pane.

Beware — if you use automatic wrapping, the logical line may be composed of several physical lines.

3.3 Building output profiles

An output profile defines how the tex file is processed and viewed; it is the sequence of commands that would be issued if you were to execute these programs from the command prompt. The output profile can be changed by the drop-down menu in the toolbar, as seen in Figure 3.6 which shows the current choice from the menu of stored output profiles on my system.

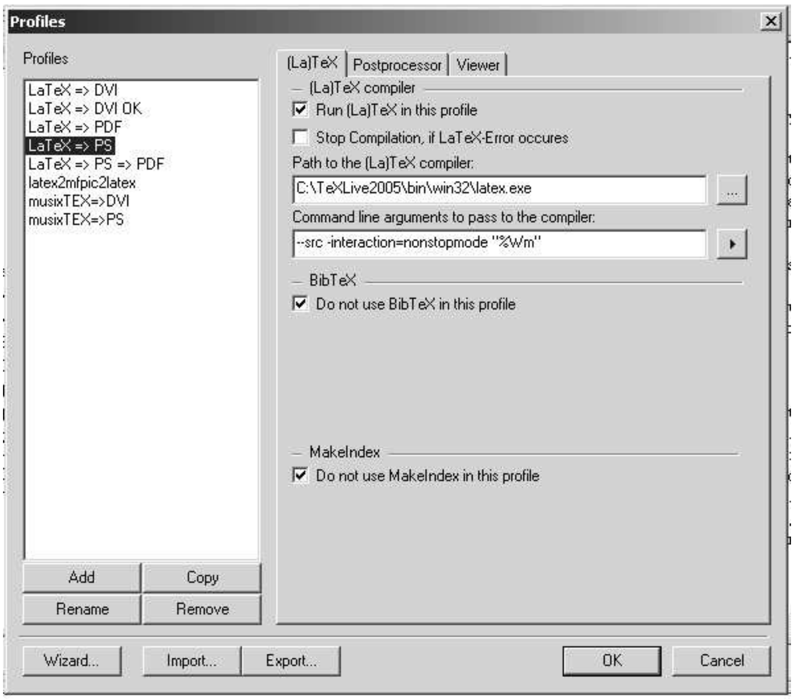
LaTeX => PS

Figure 3.6: Build menu

In addition to the output profiles provided by TeXLive2005, there are some additional ones provided on the installation disk. The output profiles on the CD all start with `OU...`, have the extension `.tco` and are to be found in the folder `Build Profiles` on CDR1203. You should install these output profiles, so insert CDR1203 into the CD-drive.

Your list of stored profiles will be different from that shown in Figure 3.7.

The **Define output profiles** from the **Build** pull-down menu (or type `ALT+F7`) is used to edit, import or create output profiles; Figure 3.7 on the facing page shows what may be seen in the **Profiles** window,



Profiles

- LaTeX => DVI
- LaTeX => DVI OK
- LaTeX => PDF
- LaTeX => PS
- LaTeX => PS => PDF
- latex2mfpic2latex
- musixTEX=>DVI
- musixTEX=>PS

(La)TeX compiler

☑ Run (La)TeX in this profile

☐ Stop Compilation, if LaTeX-Error occures

Path to the (La)TeX compiler: C:\TeXLive2005\bin\win32\latex.exe

Command line arguments to pass to the compiler: --src -interaction=nonstopmode "%Wm"

BibTeX

☑ Do not use BibTeX in this profile

MakeIndex

☑ Do not use MakeIndex in this profile

Figure 3.7: The output profiles window

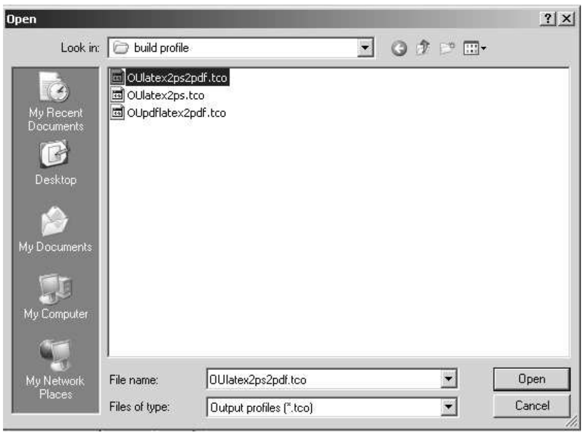
including the path for the execution program, `latex.exe` in this case, and the command line arguments passed to the program.

3.3.1 Importing output profiles

Click on **Define output profiles** from the **Build** pull-down menu (or type `ALT+F7`) to open the **Profiles** window. Click on the **Import** button, and in the new window as shown in Figure 3.8 on the next page find the folder entitled `build profile` on the CD, and choose one of the profiles. Click on **Open** and then the window shown in Figure 3.9 on the following page comes up. *Make sure that you untick* **Remove directory specifications from paths** *as otherwise all the path information is lost.* If the default file locations have been used, then the paths in the output profiles should be correct. Click on **Import** to complete the importation.

Do this on all the output profiles on the CD. Then click on **OK** to close the **Profiles** window.

Ghostview needs a license to stop it coming up with the irritating initial screen. It is as easy to view the output in Acrobat Reader.

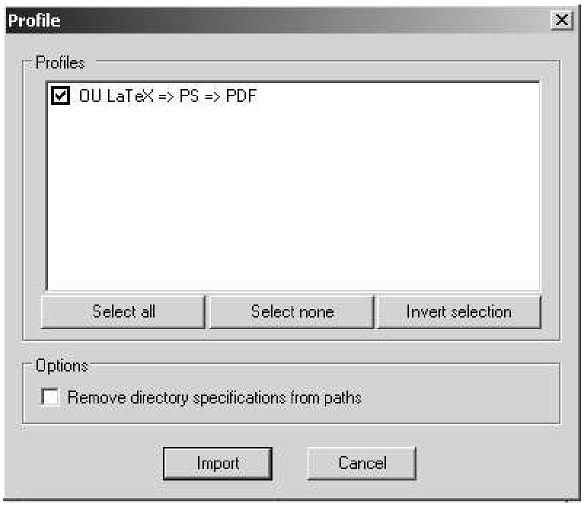


Look in: build profile

File name: OUlatex2ps2pdf.tco

Files of type: Output profiles (*.tco)

Figure 3.8: Choosing the output profile



☑ OU LaTeX => PS => PDF

☐ Remove directory specifications from paths

Figure 3.9: Choosing the output profile

Table 3.2 on page 37 shows the advantages and disadvantages of each build profile. It is recommended that you use the output profiles `OULaTeX => PS => PDF` or `OULaTeX => PS` if you don't mind the initial registration pop-up window. If you use `LaTeX => PS => PDF` or `LaTeX => PDF` you will have difficulties; these can be overcome, and an explanation of how to do this can be found via the OUSA conference (see Section 2.3.4 on page 22).

3.3.2 Exporting output profiles

It is recommended that you save your output profiles in case any files are corrupted or lost; this is a standard backup procedure. The export of profiles is very similar to that for importing. Remember to untick **Remove directory specifications from paths** as otherwise all the path information is lost.

3.4 Projects in TeXnicCenter

One important feature of TeXnicCenter is the concept of a ‘project’; a project wraps some information files around the main LaTeX or .tex file; the files are very small, and they serve a useful function.

The advantages are that:

- the current build profile is stored;
- the main file is compiled, even though one may be working on, or viewing, a different file;
- the Navigator pane comes into play
- each project can be self-contained, complete with graphics files, in its own folder.

I strongly recommend that you use projects wherever possible.

3.4.1 Compilation and viewing of LaTeX input

Towards the top-right corner of the TeXnicCenter window, you should see the row of buttons as in Figure 3.10 on the next page which are used to compile and view the LaTeX input; there are alternate function keys as well, as explained in Table 3.3 on page 38 which considers each of the buttons in Figure 3.10 on the next page in turn from left to right.

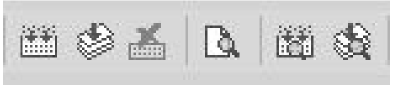


Figure 3.10: Buttons for compilation and viewing

ave
stomized my
lbar to use F4
compile and
w a project.

Each of these operations is also available within the **Build** menu.

Initially it is recommended that you compile your project at frequent intervals to check that your use of LaTeX syntax and semantics is correct as each new nugget of input is added; and then view the output as a separate operation once all the errors have been eradicated. After a time, you should have the confidence to compile at less frequent intervals, and eventually to compile and view in one operation.

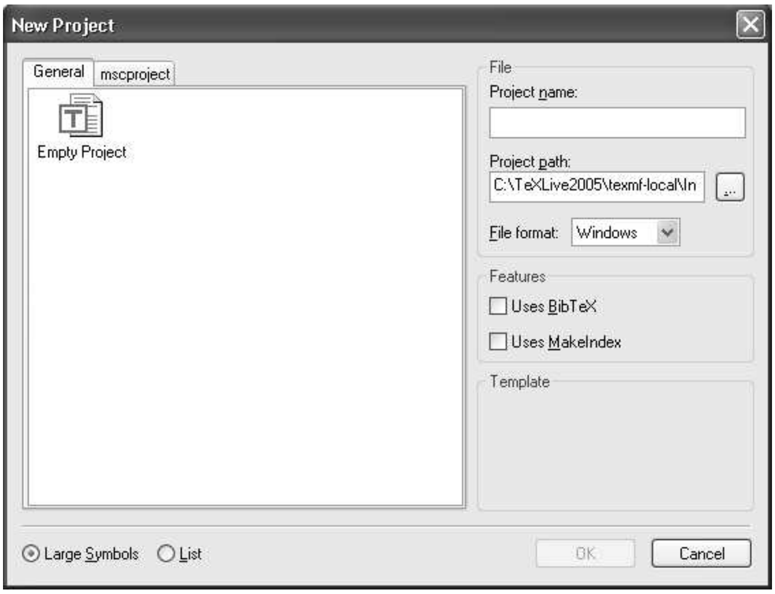
3.4.2 Using projects

To use an existing project, open the project by going to **File|Open Project...** or **File|Recent Projects...**.

To create a new project based on an existing file, click on **Project|Create with active file as main file**, and then choose appropriate options.

To create a new project from scratch, e.g. the one for your dissertation, click on **File|New Project** and a window similar to that shown in Figure 3.11 on the facing page appears. Now click on the **mscproject** tab. If you have created the right path for the template directories (as mentioned in Section 3.1 on page 24), then the template for the dissertation, should be visible, as shown in Figure 3.12 on page 36. Click on it. Then type a project name, e.g. ‘mydissertation’, in the **Project name** window on the right. Now browse the **Project path** window to find the folder `c:\TeXLive2005\texmf-local\Inputs\mscproject`. Click on **OK** to finish.

If you choose the project path folder before the project name, then a subfolder with the same name as the project name is created.



Project path: C:\TeXLive2005\texmf-local\In

File format: Windows

☐ Uses BibTeX

☐ Uses MakeIndex

● Large Symbols ○ List

Figure 3.11: The New Project window

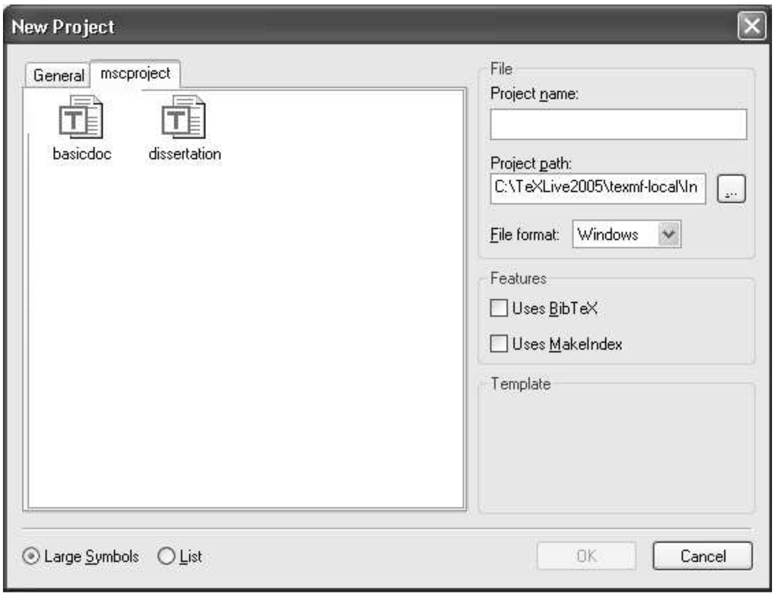
3.5 TeXnicCenter Help

I have found the TeXnicCenter Help menu very useful, and learnt a lot of new commands when using it. It is true that users often need to have an inkling of what they are seeking for Help pages to be really useful, and in this respect I find the **Index** tab useful, because it gives the details for most commands or environments.

Figure 3.13 on the next page shows a typical Help screen. The **Contents** tab has a structured overview of the main commands, in two parts: one for TeXnicCenter and one for LaTeX. This is a good place to start, by exploring the appropriate topic.

3.5.1 TeXnicCenter–Users Group

The TeXnicCenter–Users Group is a friendly and supportive group to help you with both TeXnicCenter, and to a lesser extent with LaTeX. The URL is `http://tech.groups.yahoo.com/group/TeXnicCenter-Users/` and you will have to ask for permission, which is readily granted, to join the group.

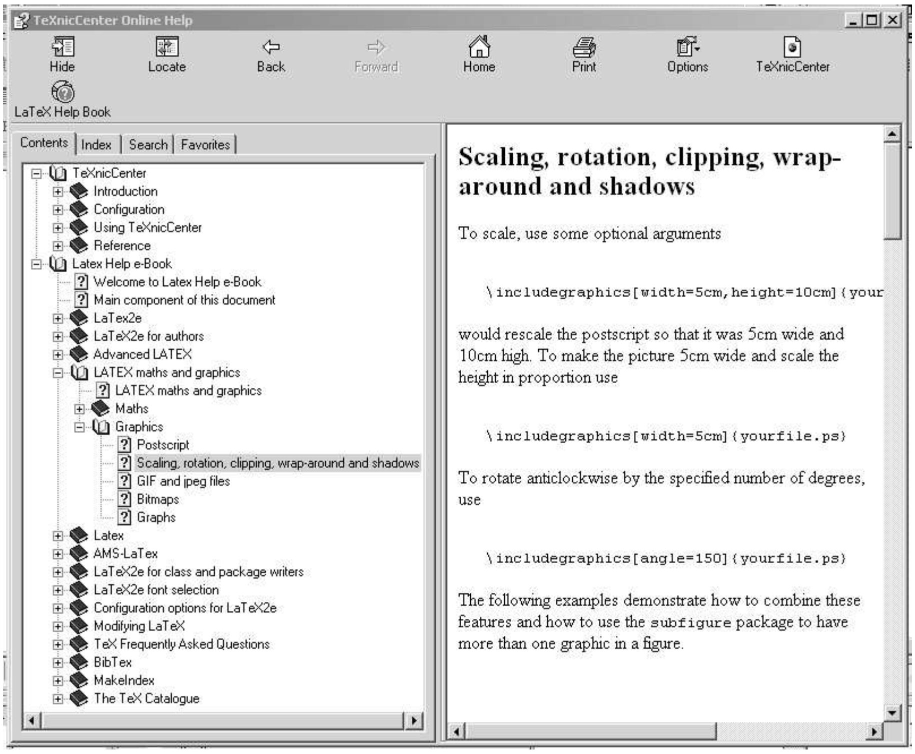


Project path: C:\TeXLive2005\texmf-local\In

File format: Windows

● Large Symbols

Figure 3.12: The folder for the dissertation template



Scaling, rotation, clipping, wrap-around and shadows

To scale, use some optional arguments

```
\includegraphics[width=5cm,height=10cm]{your
```

would rescale the postscript so that it was 5cm wide and 10cm high. To make the picture 5cm wide and scale the height in proportion use

```
\includegraphics[width=5cm]{yourfile.ps}
```

To rotate anticlockwise by the specified number of degrees, use

```
\includegraphics[angle=150]{yourfile.ps}
```

The following examples demonstrate how to combine these features and how to use the `subfigure` package to have more than one graphic in a figure.

Figure 3.13: TeXnicCenter Help window

Table 3.2: Features of different build profiles

Build profile	Advantages	Disadvantages
`LaTeX => DVI`	Works well	Won't show graphics files
`LaTeX => PDF`		Won't work without a tweak
`LaTeX => PS`	Works well & graphics file format is EPS	Annoying registration pop-up when first open; assumes you want a bibliography and index
`LaTeX => PS => PDF`		Won't work without a tweak
`OU LaTeX => PS`	Works well & graphics file format is EPS	Annoying registration pop-up when first open
`OU LaTeX => PS => PDF`	Works well & graphics file format is EPS, but viewer is Acrobat Reader	
`OU pdfLaTeX => PDF`	Uses Acrobat Reader & graphics file format can be JPEG, PNG, PDF or Metapost	graphics file format cannot be EPS

Table 3.3: The operations on a file or project

Icon	Function keys	Operation
	F7	Compiles the main file of the project, regardless of which file is selected with the tab
	CTRL+F7	Compiles only the file which is selected with the tab
		Stops the compilation; useful if there are too many errors
	F5	View the compiled file in whatever viewer has been specified in the output profile
	CTRL+F5	Compile the main file of the project and view the compiled project in one operation (equivalent to **F7** followed by **F5**)
	CTRL+Shift+F5	Compile only the selected file and view the output in one operation (equivalent to **CTRL+F7** followed by **F5**)

Appendix A

The production process for LaTeX documents

There are three stages to produce a view of the finished document using LaTeX; there are several ways to do it, but the most common ones are:

However, using `Notepad` is not recommended.

1. produce a text with the correct LaTeX commands, using any text processor, even `Notepad`;
2. compile this using `latex.exe`, to obtain a dvi (**de**vice **i**ndependent) file, or using `pdflatex.exe` to obtain a pdf file;
3. view the file:
   (a) using `windvi.exe` if it is a dvi file;
   (b) using Adobe Reader if it is a pdf file;
   (c) using Ghostview to view the postscript file produced by further processing the dvi file with `dvips.exe`.

Figure A.1 on the following page is an example of using the `picture` environment within LaTeX, and it is useful for simple diagrams (see Section 2.2.5 on page 17).

This may seem like a lot of operations, and, before the advent of IDEs (integrated development environment), each of these was a separate DOS (Unix or VMS) command. With an IDE such as TeXnicCenter the file can be compiled and viewed in one click of a button, even using the route wherein a postscript file is produced. A summary diagram of the steps is shown in Figure A.1.

I usually use the dvips and Ghostview route, using the output profile `OU LaTeX => PS`. Many of the extensions to basic LaTeX work only under postscript, and won't be visible when viewing the dvi file. The postscript file can be converted into a pdf file within Ghostview, or using ps2pdf. I have included the output profile `OU LaTeX => PDF` as well in case you want to view the output in Acrobat Reader.

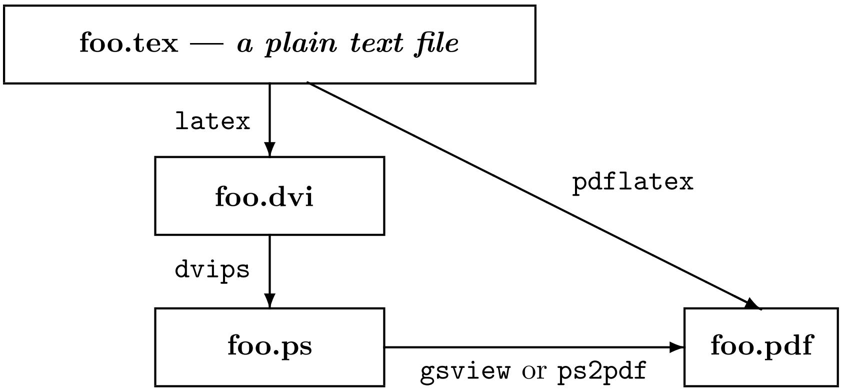


Figure A.1: Summary of LaTeX process